Center Independent Research & Development: GSFC IRAD

Software Bus Network Message Routing Protocol (SBN)

Completed Technology Project (2016 - 2017)

Project Introduction

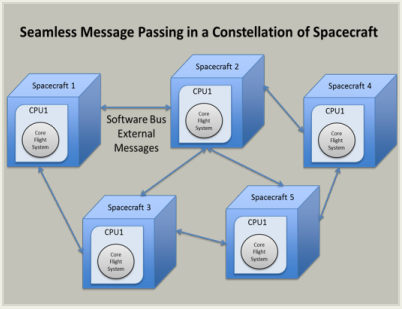
The Software Bus Network (SBN) is a software application that enables seamless flight software communication between multiple processors or spacecraft. The SBN is an application that depends on the Core Flight Software (CFS) developed by Goddard Space Flight Center (GSFC). A version of the SBN application currently exists, but is limited by the fact that processors or spacecraft must be directly connected in order to make use of the SBN. This effort proposes to remove that limitation by implementing a router capability that will be able to send messages between processors or spacecraft that are not directly connected by relaying them through intermediate nodes.

The Core Flight Software (CFS) is a framework of reusable flight software services and applications. A key component of the CFS is a message bus that allows different software applications to send messages to one another using a publish/subscribe method. The message bus connects applications that are running on the same processor. As flight software becomes more complex, it becomes necessary to use multiple processors or even multiple spacecraft. The Software Bus Network (SBN) application makes it easier to use CFS software on multiple processors or spacecraft by providing a way for applications to communicate over a variety of interfaces. The SBN acts as a kind of bridge between the message buses on different processors. This allows communication to take place in a way that is transparent to all of the other software applications being used.

Anticipated Benefits

NASA has several large funded missions that use the Core Flight Software (CFS). This application can be used on any such mission that uses the CFS on multiple processors or spacecraft.

NASA has several unfunded or planned Distributed Spacecraft Missions. The Core Flight Software (CFS) Software Bus Network (SBN) application can be used to provide software communication between the various spacecraft used in a DSM.



A potential distributed spacecraft mission with 5 spacecraft. With the current version of the SBN, spacecraft 1 and 4 could not communicate. With the modified SBN, spacecraft 1 and 4 would be able to communicate indirectly…

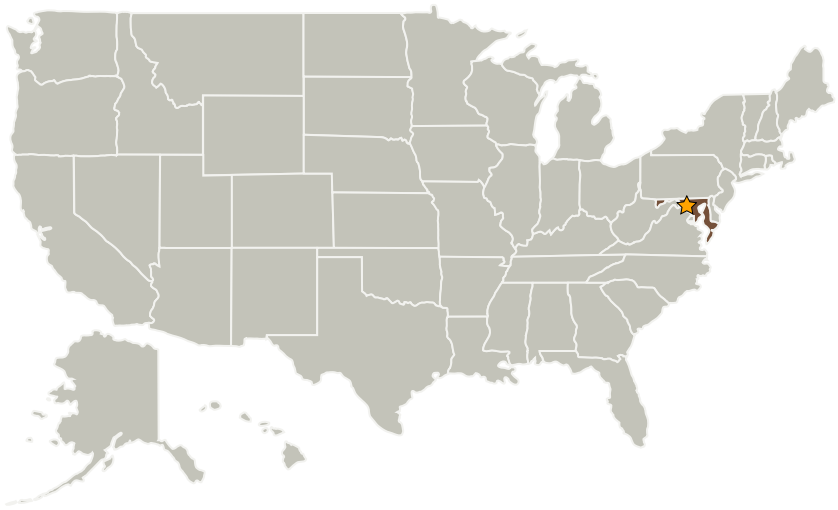
Table of Contents

Center Independent Research & Development: GSFC IRAD

Software Bus Network Message Routing Protocol (SBN)

Completed Technology Project (2016 - 2017)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations
Maryland

Project Transitions

October 2016: Project Start

Organizational Responsibility

Responsible Mission Directorate:

Mission Support Directorate (MSD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Center Independent Research & Development: GSFC IRAD

Project Management

Program Manager:

Peter M Hughes

Project Managers:

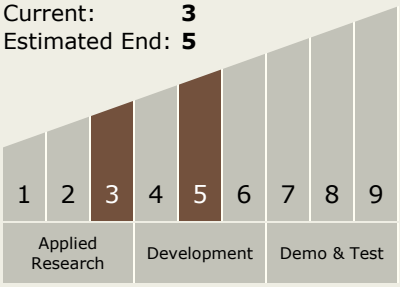
Jacqueline J Le Moigne-stewart
Michael A Johnson

Principal Investigator:

Elizabeth J Geist

Technology Maturity (TRL)

Start: **3**
Current: **3**
Estimated End: **5**



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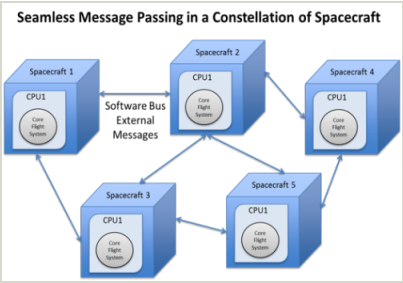
September 2017: Closed out

Closeout Summary: The purpose of the Goddard Space Flight Center's Internal Research and Development (IRAD) program is to support new technology development and to address scientific challenges. Each year, Principal Investigators (PIs) submit IRAD proposals and compete for funding for their development projects. Goddard's IRAD program supports eight Lines of Business: Astrophysics; Communications and Navigation; Cross-Cutting Technology and Capabilities; Earth Science; Heliophysics; Planetary Science; Science Small Satellites Technology; and Suborbital Platforms and Range Services.Task progress is evaluated twice a year at the Mid-term IRAD review and the end of the year. When the funding period has ended, the PIs compete again for IRAD funding or seek new sources of development and research funding or agree to external partnerships and collaborations. In some cases, when the development work has reached the appropriate Technology Readiness Level (TRL) level, the product is integrated into an actual NASA mission or used to support other government agencies. The technology may also be licensed out to the industry.The completion of a project does not necessarily indicate that the development work has stopped. The work could potentially continue in the future as a follow-on IRAD; or used in collaboration or partnership with Academia, Industry and other Government Agencies.If you are interested in partnering with NASA, see the TechPort Partnerships documentation available on the TechPort Help tab. http://techport.nasa.gov/help

Images



SBN Example
A potential distributed spacecraft mission with 5 spacecraft. With the current version of the SBN, spacecraft 1 and 4 could not communicate. With the modified SBN, spacecraft 1 and 4 would be able to communicate indirectly through spacecraft 2. *(https://techport.nasa.gov/image/26070)*

Project Website:

http://aetd.gsfc.nasa.gov/

Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.4 Information Processing
    - TX11.4.5 Cyber Infrastructure

Target Destination

Foundational Knowledge